9D20 Ver. 2/3/2020

Based on the 2020 BCNYS, MCNYS, FGCNYS, PCNYS, ECCCNYS,

APPENDIX

General Construction Principals Student Exercises and Supplemental Material

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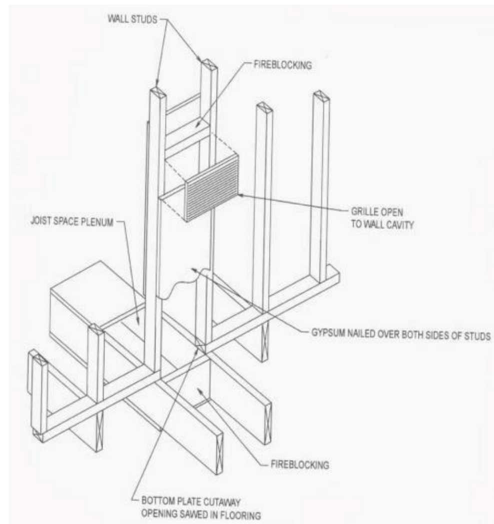
Appendix

Exercise 1 – Chapter 6 Plenum

EXERCISE: What are the 6 conditions a plenum must meet if it is installed in a stud cavity, and what section applies?

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________
6. ______________________________



Exercise 2 Chapter 6 Ducts Systems

Please list section, which the answer is found in, as well as your answer:

1. What is the maximum length of a flexible air duct?

____

2. If a service opening is concealed by a duct covering, what must be done?

____

3. How is the access point for damper inspection have to be labeled?

____

Appendix

Exercise 3 – Chapter 8 Chimneys & Vents

Please list section, which the answer is found in, as well as your answer:

1. Can an abandoned inlet opening be left open? ______________________________

2. Can a solid fuel-burning device be vented into a chimney flue being used by another appliance? ______________________________

3. Does a masonry chimney need a lining? ______________________________

4. Can appliances on different floors of a building be tied into a common vent?

   ____

5. What is used to determine the size, installation and termination point of a vent?

   ____

6. When is the only time a manual damper can be installed in a connector?

   ____

7. Can an appliance using a power exhauster continue to operate if the power exhauster is “off”?

   ____

Exercise 4 Chapter 3 General Requirements

Please list section, which the answer is found in, as well as your answer:

1. What is the maximum depth of a notch cut in the end of a joist?

____

2. What is the maximum that a load bearing stud in an exterior wall can be cut or notched?

____

3. What is the maximum diameter hole that can be bored in a wood stud (bearing wall)

____

4. How is the size of a hole bored in a structural steel framing member determined?

____

Exercise 5 – Chapter 5 Fuel Gas Code

Using Table 503.4 List what type of vent needs to be used for :

1. Listed vented wall furnace ______________________
2. Incinerator ______________________
3. Combination gas/solid fuel burning equipment ______________________
4. Gas-fired toilet ______________________

Appendix

Exercise 6 - Chapter 4 Gas Piping Installations

Please list section, which the answer is found in, as well as your answer

1. Can plastic pipe be run through a building to serve the equipment to be installed.

   ____

2. How is the nonmetallic pipe ‘marked’ when installed underground?

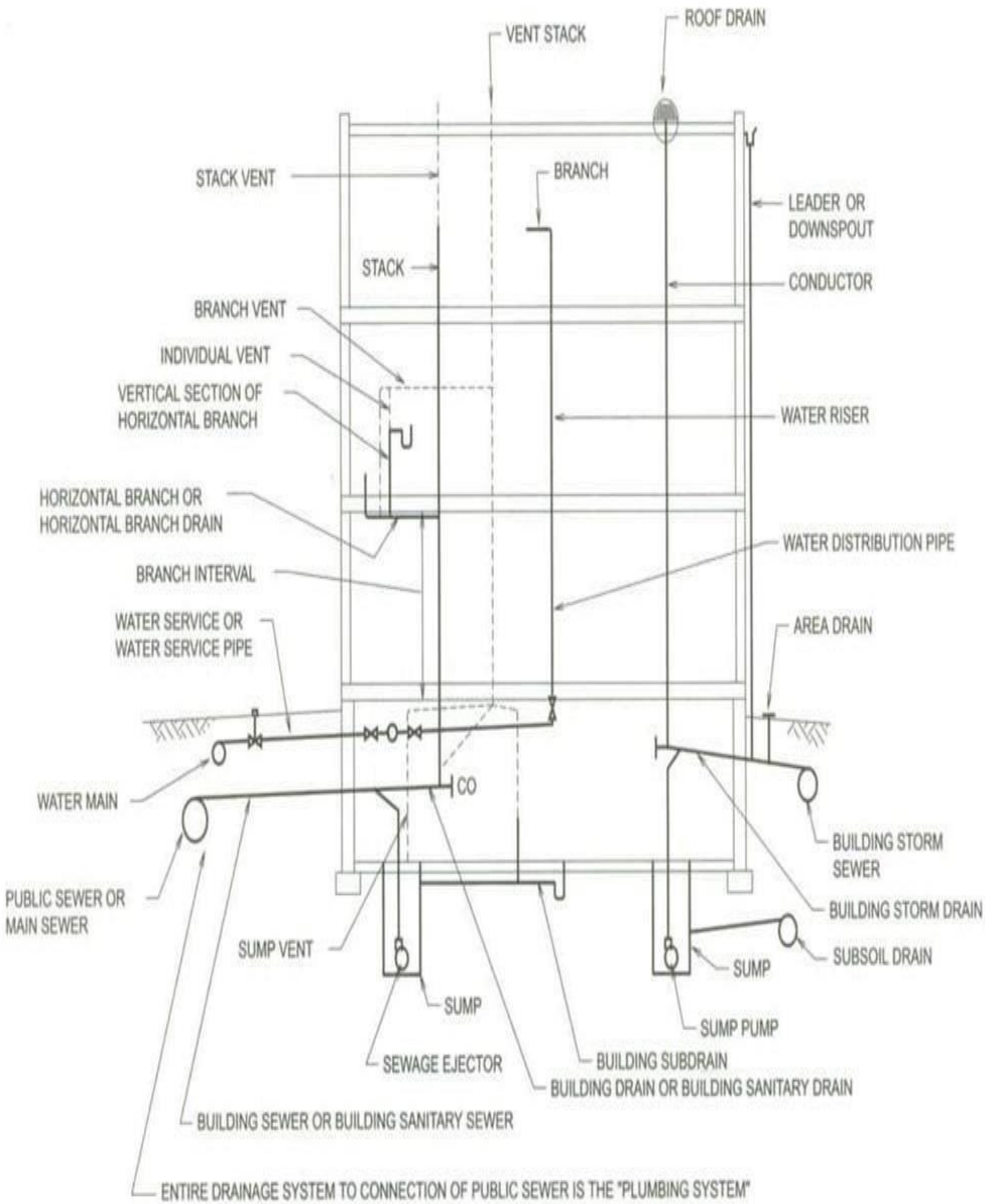
   ____

3. Can a clothes dryer vent ever terminate inside a structure?

   ____

Appendix

Definitions



Appendix

Exercise 7 – Chapter 4 Fixture Count

Proposed – 1,000 seat theater

Determine the minimum number of water closets, urinals, lavatories and drinking fountains needed per Table 403.1 (male & female)

Fixture type	Male	Female
Water closet		
Urinal		
Lavatories		
Drinking fountain		

Exercise 8 – Chapter 4 Fixture Details

Please list section which answer is found in as well as your answer:

1. What is the minimum size for a bathtub waste outlet? ___________________________
2. What is the minimum size of a shower compartment? ___________________________
3. What is the minimum size of a waste outlet serving a sink? ___________________________
4. What is the maximum temperature for a tub-shower mixing valve faucet?

____

Appendix

Exercise 9 - Chapter 7 – Fixture Details

Verify the DFU and minimum trap size for the following fixtures:

FIXTURE	DFU	TRAP
Bathtub		
Domestic kitchen sink		
Private water closet (1.6gpf)		

Exercise 10 - Chapter 7 - Drainage System Sizing

Step 1 – VERIFY the total proposed DFU (Table 709.1)

(1) domestic kitchen sink ___

(3) private WC @ 1.6 gpf each ___

(3) Lavatories ___

(1) bathtub with a shower ___

(1) shower (5.7 gpm or less) ___

(1) residential clothes washing machine ___

(1) domestic dish washer ___

Total of DFU ___

Step 2 – Determine the maximum DFU that can be connected to a 2½” pipe with a slope of ¼” per foot.

Step 3 – compare the proposed DFU to the allowable DFU.

Proposed DFU =

Allowed DFU =

Exercise 11 – Chapter 9 Vent System sizing

Using Table 906.1, determine the maximum length of the vent for the following:

1. 3” soil stack, 21 DFU, vent diameter is 2½” ________
2. 4” waste stack, 100 DFU, vent diameter is 3” ________
3. 10” soil stack, 12,000 DFU, vent diameter is 8” ________
4. 15” waste stack, 39,000 DFU, vent diameter is 5” ________

Exercise 12 - Using Table 1604.5, determine the Risk Category based on the nature of the occupancy

NATURE OF OCCUPANCY	RISK CATEGORY
Auditorium with an occupant load of 1000	
Fire station	
Farmer Ted’s cow barn	
Eight unit apartment building	
Elementary school	
County jail	
Self-storage building	
Power station	
Your house	

Seismic Design Category worksheet

SAMPLE

Location: ____

Zip Code: _______________

S_s _______

S_1 _______

Site Class	**Use Group**		
	I or II	**III**	**IV**
A … $S_{DS} = S_{MS}$ (2/3) $S_{D1} = S_{M1}$ (2/3)			
B … $S_{DS} = S_{MS}$ (2/3) $S_{D1} = S_{M1}$ (2/3)			
C … $S_{DS} = S_{MS}$ (2/3) $S_{D1} = S_{M1}$ (2/3)			
D … $S_{DS} = S_{MS}$ (2/3) $S_{D1} = S_{M1}$ (2/3)			
E … $S_{DS} = S_{MS}$ (2/3) $S_{D1} = S_{M1}$ (2/3)			

SMS = F_aS_s

SM1 = F_vS_1

Figure 1613.3.1(1) for S_S

Figure 1613.3.1(2) for S_1

TABLE 1613.3.3(1) for F_a **values of** S_S

TABLE 1613.3.3(2) for F_v **values of** S_1

TABLES 1613.3.5(1) and 1613.3.5(2) for SDC categories

Exercise 13 – Using Table 1607.1, determine the uniformly distributed live load based on the occupancy or use

Occupancy or Use	Uniform Load psf
Heavy Manufacturing	
Office Building Offices	
Wholesale Store	
Stairs and exits (not in one-and two-family dwellings)	
School Classrooms	
Jail Corridor	
Private room in a hotel	
Marquees	

Concrete basics

In its simplest form, concrete is a mixture of paste and aggregates. The paste, composed of portland cement and water, coats the surface of the fine and coarse aggregates. Through a chemical reaction called hydration, the paste hardens and gains strength to form the rocklike mass known as concrete. Within this process lies the key to a remarkable trait of concrete: it's plastic and malleable when newly mixed, strong and durable when hardened. These qualities explain why one material, concrete, can build skyscrapers, bridges, sidewalks and superhighways, houses and dams. The key to achieving a strong, durable concrete rests in the careful proportioning and mixing of the ingredients. A concrete mixture that does not have enough paste to fill all the voids between the aggregates will be difficult to place and will produce rough, honeycombed surfaces and porous concrete. A mixture with an excess of cement paste will be easy to place and will produce a smooth surface; however, the resulting concrete is likely to shrink more and be uneconomical. A properly designed concrete mixture will possess the desired workability for the fresh concrete and the required durability and strength for the hardened concrete. Typically, a mix is about 10 to 15 percent cement, 60 to 75 percent aggregate and 15 to 20 percent water. Entrained air in many concrete mixes may also take up another 5 to 8 percent. Portland cement's chemistry comes to life in the presence of water. Cement and water form a paste that coats each particle of stone and sand. Through a chemical reaction called hydration, the cement paste hardens and gains strength. The character of the concrete is determined by quality of the paste. The strength of the paste, in turn, depends on the ratio of water to cement. The water-cement ratio is the weight of the mixing water divided by the weight of the cement. High-quality concrete is produced by lowering the water-cement ratio as much as possible without sacrificing the workability of fresh concrete. Generally, using less water produces a higher quality concrete provided the concrete is properly placed, consolidated, and cured.

Basics

Other Ingredients

Although most drinking water is suitable for use in concrete, aggregates are chosen carefully. Aggregates comprise 60 to 75 percent of the total volume of concrete. The type and size of the aggregate mixture depends on the thickness and purpose of the final concrete product. Almost any natural water that is drinkable and has no pronounced taste or odor may be used as mixing water for concrete. However, some waters that are not fit for drinking may be suitable for concrete. Excessive impurities in mixing water not only may affect setting time and concrete strength, but also may cause efflorescence, staining, corrosion of

reinforcement, volume instability, and reduced durability. Specifications usually set limits on chlorides, sulfates, alkalis, and solids in mixing water unless tests can be performed to determine the effect the impurity has on various properties. Relatively thin building sections call for small coarse aggregate, though aggregates up to six inches (150 mm) in diameter have been used in large dams. A continuous gradation of particle sizes is desirable for efficient use of the paste. In addition, aggregates should be clean and free from any matter that might affect the quality of the concrete.

Concrete basics

Hydration Begins

Soon after the aggregates, water, and the cement are combined, the mixture starts to harden. All portland cements are hydraulic cements that set and harden through a chemical reaction with water. During this reaction, called hydration, a node forms on the surface of each cement particle. The node grows and expands until it links up with nodes from other cement particles or adheres to adjacent aggregates. The building up process results in progressive stiffening, hardening, and strength development. Once the concrete is thoroughly mixed and workable it should be placed in forms before the mixture becomes too stiff. During placement, the concrete is consolidated to compact it within the forms and to eliminate potential flaws, such as honeycombs and air pockets. For slabs, concrete is left to stand until the surface moisture film disappears. After the film disappears from the surface, a wood or metal handfloat is used to smooth off the concrete. Floating produces a relatively even, but slightly rough, texture that has good slip resistance and is frequently used as a final finish for exterior slabs. If a smooth, hard, dense surface is required, floating is followed by steel troweling. Curing begins after the exposed surfaces of the concrete have hardened sufficiently to resist marring. Curing ensures the continued hydration of the cement and the strength gain of the concrete. Concrete surfaces are cured by sprinkling with water fog, or by using moisture-retaining fabrics such as burlap or cotton mats. Other curing methods prevent evaporation of the water by sealing the surface with plastic or special sprays (curing compounds). Special techniques are used for curing concrete during extremely cold or hot weather to protect the concrete. The longer the concrete is kept moist, the stronger and more durable it will become. The rate of hardening depends upon the composition and fineness of the cement, the mix proportions, and the moisture and temperature conditions. Most of the hydration and strength gain take place within the first month of concrete's life cycle, but hydration continues at a slower rate for many years.

Appendix

Concrete basics

Concrete continues to get stronger as it gets older.

The Forms of Concrete

Concrete is produced in four basic forms, each with unique applications and properties. Ready mixed concrete, by far the most common form, accounts for nearly three-fourths of all concrete. It's batched at local plants for delivery in the familiar trucks with revolving drums. Precast concrete products are cast in a factory setting. These products benefit from tight quality control achievable at a production plant. Precast products range from concrete bricks and paving stones to bridge girders, structural components, and panels for cladding. Concrete masonry, another type of manufactured concrete, may be best known for its conventional 8 x 8 x 16-inch block. Today's masonry units can be molded into a wealth of shapes, configurations, colors, and textures to serve an infinite spectrum of building applications and architectural needs. Cement-based materials represent products that defy the label of "concrete," yet share many of its qualities. Conventional materials in this category include mortar, grout, and terrazzo. Soil-cement and roller-compacted concrete"cousins" of concreteare used for pavements and dams. Other products in this category include flowable fill and cement-treated bases. A new generation of advanced products incorporates fibers and special aggregate to create roofing tiles, shake shingles, lap siding, and countertops. And an emerging market is the use of cement to treat and stabilize waste.

Concrete Questions and Answers:

What does 28 -day strength mean?

Concrete hardens and gains strength as it hydrates. The hydration process continues over a long period of time. It happens rapidly at first and slows down as time goes by. To measure the ultimate strength of concrete would require a wait of several years. This would be impractical, so a time period of 28 days was selected by specification writing authorities as the age that all concrete should be tested. At this age, a substantial percentage of the hydration has taken place.

What is 3,000 pound concrete?

It is concrete that is strong enough to carry a compressive stress of 3,000 psi at 28 days. Concrete may be specified at other strengths as well. Conventional concrete has strengths of 7,000 psi or less; concrete with strengths between 7,000 and 14,500 psi is considered high strength concrete.

How do you control the strength of concrete?

The easiest way to add strength is to add cement. The factor that most predominantly influences concrete strength is the ratio of water to cement in the cement paste that binds the aggregates together. The higher this ratio is, the weaker the concrete will be and vice versa. Every desirable physical property that you can measure will be adversely affected by adding more water.

Appendix

Cold Weather Masonry Construction Details

Preparation for temperatures below 40°F If ambient or CMU temperature is below 40°F	
Masonry units	Not less than 20°F, remove snow and ice
Surface to receive new construction	Heated to above freezing

DURING Construction		
Temperature	Component	Requirement
Below 40°F	Glass block	Not permitted
	Water and aggregate	For mortar and grout, heated, not above 140°F
	Mortar sand and mixing water	Heated to produce mortar temperature between 40°F 120°F
Below 32°F	Mortar	Maintain above freezing until used
	Grout sand and mixing water	Heated to produce grout temperature between 70°F 120°F, maintain grout above 70°F until used
Below 25°F	Masonry surfaces	Heated to 40°F
	Masonry structure	Install wind break if wind velocity > 15 mph
	Grouted wall	Heated to 40°F prior to grouting
Below 20°F	Masonry structure	Enclose and heat to > 32°F

COMPLETED Construction	
Mean DailyTemperature*	Requirement
Glass Units	Maintain above 40°F for 48 hours
Between 40°F and 25°F	Weather-resistant membrane protection for 24 hours
Between 25°F and 20°F	Covered with insulating blankets or equal, 24 to 48 hours
Below 20°F	Enclose and heat to maintain > 32°F, 24 to 48 hours

when either the ambient temperature falls below 40°F (4°C) or the temperature of masonry units is below 40°F (4°C).

Concrete Detail Exercise 14

Answer the following questions using Chapter 19

A. What is the minimum thickness of a concrete floor slab supported directly on the ground?
Answer _________ Code Citation: __________

B. What is the maximum size of the reinforcement when used in Shotcrete?

Answer _________ Code Citation: __________

C. Structural plain concrete shall comply with what Building Code Section?

Answer _________ Code Citation: ___________

Masonry Detail Exercise 15

Answer the following questions using Chapter 21

A. Hearth extensions shall extend at least ___ inches in front of the fireplace opening where that opening is less than 6 square feet. Answer _________ Code Citation: __________

B. What is the minimum air space clearance from any portion of a masonry chimney located in the interior of the building to combustibles?

Answer _________ Code Citation: __________

C. Chimneys shall extend at least ____ feet higher than any portion of the building within ____ feet, but shall not be less than ____ feet above the point where the chimney passes through the roof..

Answer _________ Code Citation: __________

Appendix

Span Table Exercise 16

Given the following information, determine the applicable <u>Table</u> in the Building Code

Member, Location and/or Load	Table
Interior Bearing Header	
Rafters - ceiling directly attached, 50 PSF ground snow load	
Floor Joists for 2nd floor, sleeping rooms only	
Wall studs size, heights and spacing	
Exterior Bearing Girder	
Floor joists - living areas, 40 PSF live load	
Rafters - no ceiling attached, 40 PSF ground snow load	
Ceiling joists - uninhabitable attic, limited storage, 20 PSF live load	

Appendix

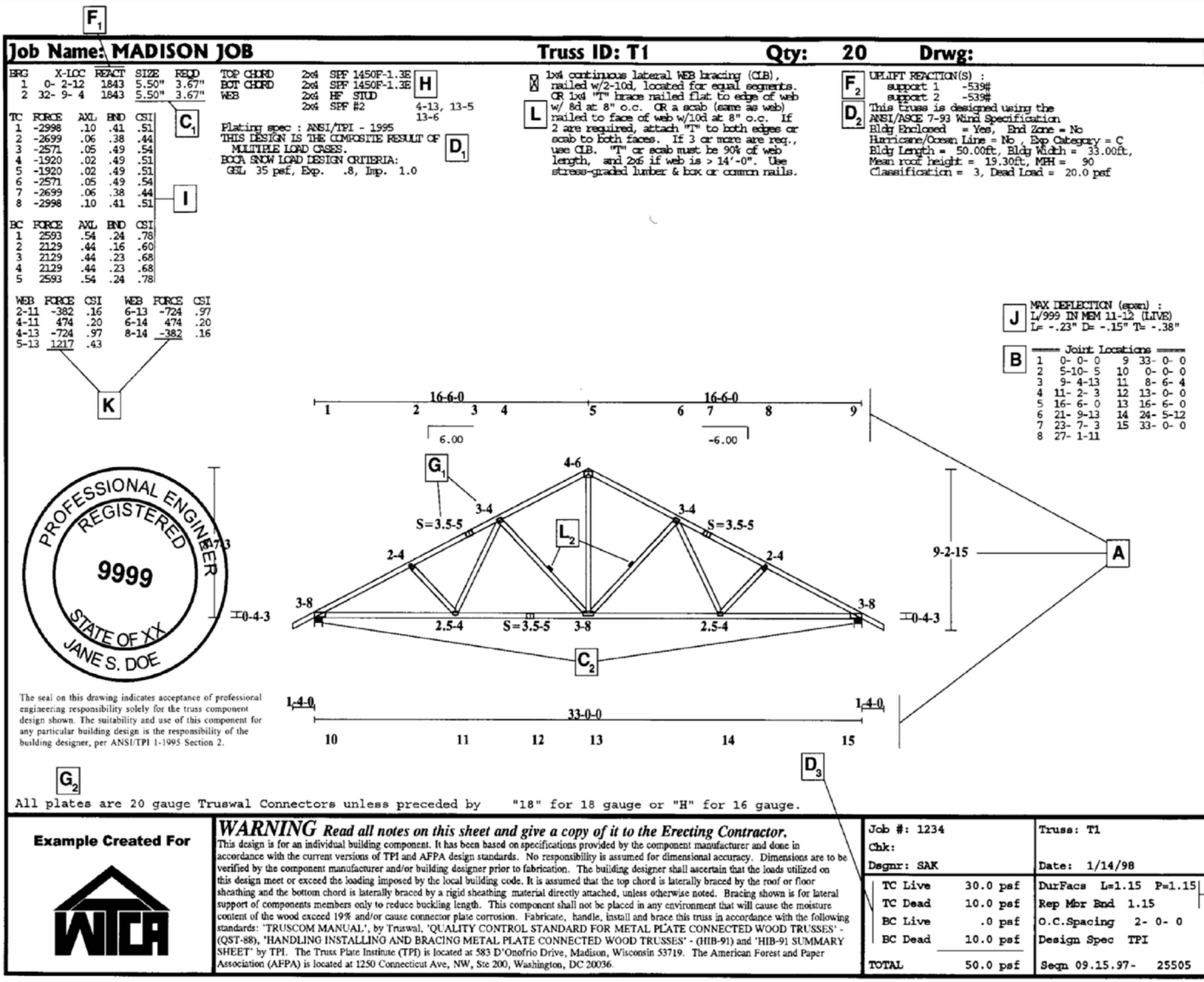
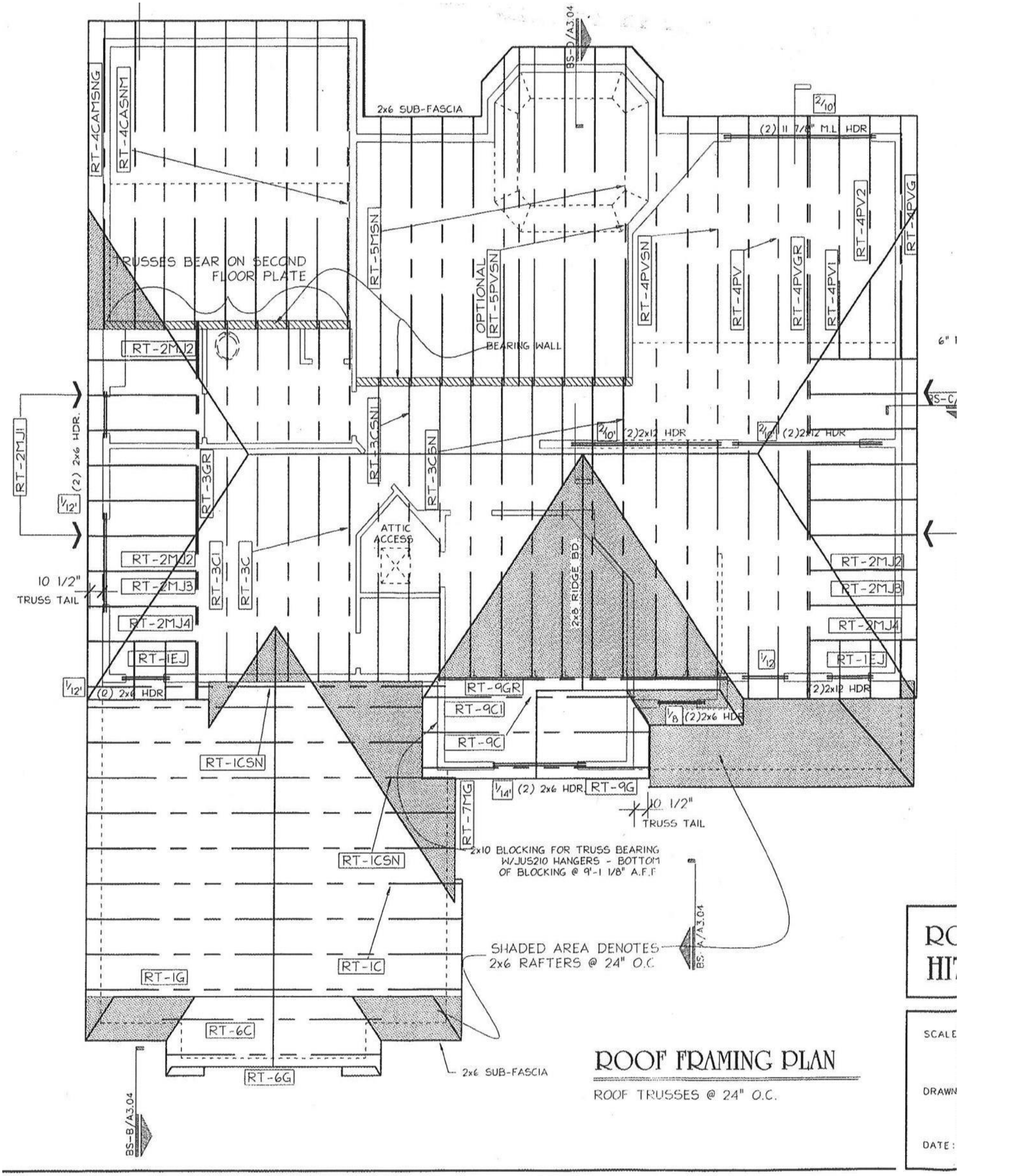


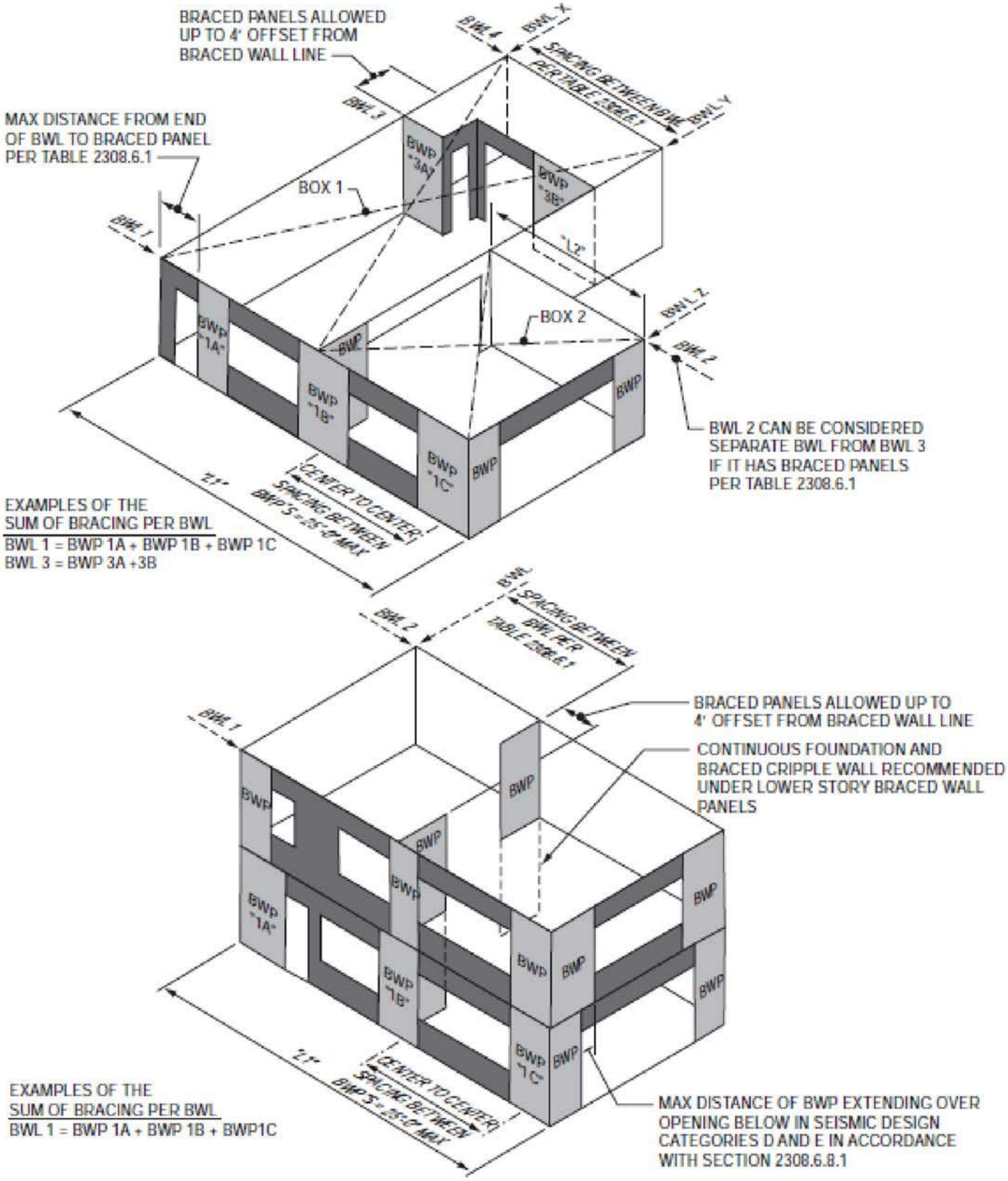
Figure 3a shows an example of a truss design drawing for a pitched chord truss. Provided courtesy of Lumber Specialties, Dyersville, IA. See Key on opposite page.

Appendix

2303.4.1.1 Truss design drawings

1. Slope or depth, span and spacing;
2. Location of joints;
3. Number of plies if greater than 1
4. Required bearing widths;
5. Design loads as applicable, including:
   - 5.1 Top chord live load;
   - 5.2 Top chord dead load;
   - 5.3 Bottom chord live load
   - 5.4 Bottom chord dead load;
   - 5.5 Additional loads and locations;
   - 5.6 Environmental loads;
6. Other lateral loads;
7. Adjustments to lumber and metal connector plate design value;
8. Maximum reaction force and direction;
9. Metal connector plate type, size, thickness or gage, and the location;
10. Lumber size, species and grade for each member;
11. Truss to truss connection and truss field assembly requirements
12. Calculated deflection ratio and maximum vertical and horizontal deflection;
13. Maximum axial tensile and compression forces; and
14. Required permanent individual truss member restraint location and methods and details of restraint / bracing per Section 2303.4.1.2


2x6 SUB-FASCIA
TRUSSES BEAR ON SECOND FLOOR PLATE
BEARING WALL
ATTIC ACCESS
2x8 RIDGE BD.
10 1/2" TRUSS TAIL
2x10 BLOCKING FOR TRUSS BEARING W/JUS210 HANGERS - BOTTOM OF BLOCKING @ 9'-1 1/8" A.F.F.
SHADED AREA DENOTES 2x6 RAFTERS @ 24" O.C.
ROOF FRAMING PLAN
ROOF TRUSSES @ 24" O.C.
SCALE
DRAWN
DATE:

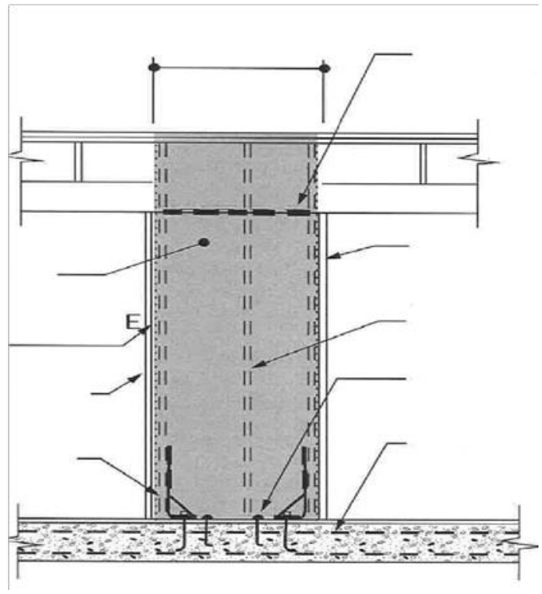


SI: 1 foot = 304.8 mm.

FIGURE 2308.6.1
BASIC COMPONENTS OF THE LATERAL BRACING SYSTEM

Alternate Braced Wall

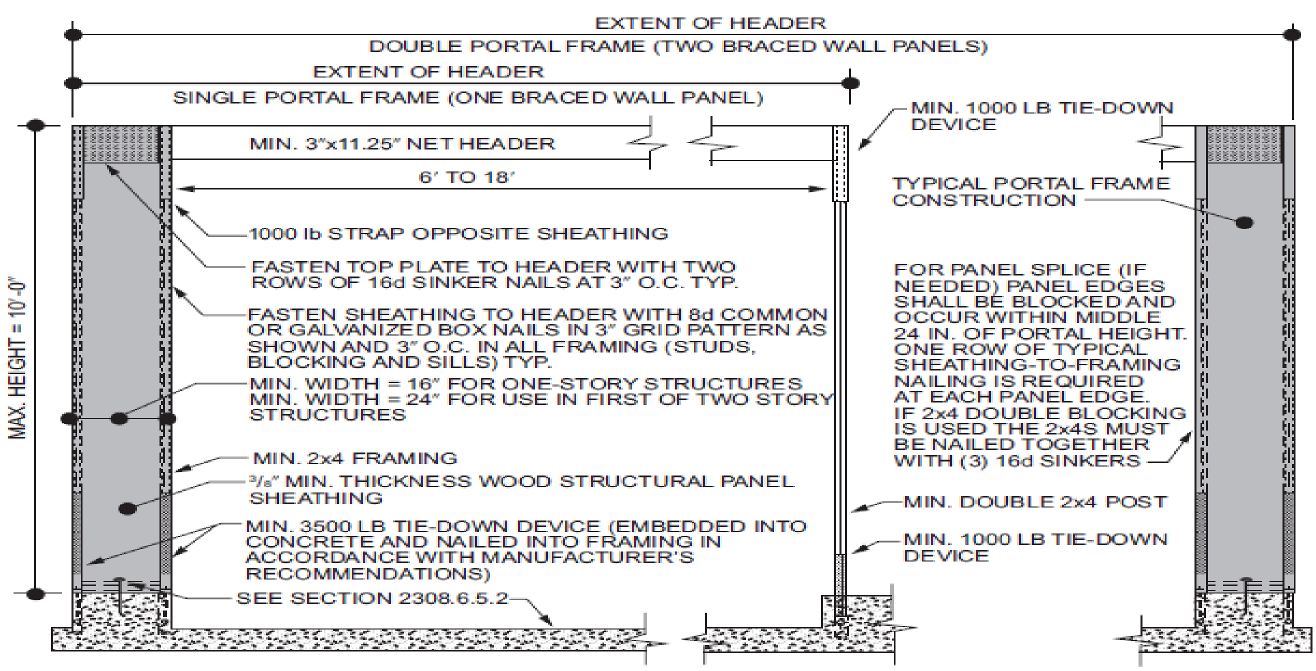
This method is the similar to Method 3 of the conventional braced wall provisions, however it allows for walls to be built as narrow as 2'- 8 " provided that holdowns , additional anchor bolts, and for two-story structures additional nails and sheathing are also installed. These wall segments can be used to replace any braced wall panel in the non- continuously or continuously sheathed method. Framing requirements vary for one- or two-story structures as described in the figure.



2308.6.5.2 Portal frame w/ hold downs

Alternate Braced Wall Panel adjacent to Door or Window Opening

A new method for bracing which allows walls to be built 16" long for a one-story building or 24" for a two-story building. As shown in the figure, this method requires significant additional framing, including a continuous header over the top of the wall segment tied to the studs below, to allow the panels to be so narrow



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.448 N.

FIGURE 2308.6.5.2
PORTAL FRAME WITH HOLD-DOWNS (PFH)

One- and Two-story Buildings